

## HAMMARLUND MODEL SP-400-X

TRADE NAME Hammarlund Model SP-400-X  
 MANUFACTURER Hammarlund Mfg. Co., 460 W. 34th Street, New York, N.Y.  
 TYPE SET AC Operated 5 Band Superheterodyne Communications Receiver  
 TUBES (EIGHTEEN) Types, 6K7 1st RF Amp., 6K7 2nd RF Amp., 6L7 1st Det., 6J7 HF Osc., 6K7 1st IF Amp., 6SK7 2nd IF Amp., 6SK7 3rd IF Amp., 6H6 2nd Det., 6N7 Noise Limiter, 6SJ7 BF Osc., 6SK7 AVC Amp., 6H6 AVC Rectifier, 6J5 1st AF Amp., 6F6 AF Driver, (2) 6F6 AF Output, 5U4G & 5Y3GT Rectifiers.  
 POWER SUPPLY 105-125 Volts AC or 6 Volt Storage Battery (A Supply), 5-45 Volt "B" Batteries, 1-45 Volt "C" Batteries.  
 AC RATING .146 Amps. @ 117V AC  
 BATTERY RATING Filament Supply - 6.25 Amps. @ 6V DC  
 Plate Supply - 117MA @ 225V DC  
 Screen Supply - 4.5MA @ 90V DC  
 C Bias Supply - 10MA @ 45V DC  
 TUNING RANGE - BROADCAST 540-1240 KC, 1.24 - 2.86 MC SHORT WAVE 2.85 - 6.3 MC, 6.3 - 14.0 MC, 13.4 - 30.0 MC.

Note: Voltages and resistance readings taken in the number 1 position of the band switch. Readings for the beat frequency oscillator (tube #10) taken in the CW position. Controls set as follows: Crystal selectivity - off; Limiter - on; Sensitivity - maximum; AVC - on; Signal - mod.; Audio gain - maximum; Send - Receive Sw. - receive.

### VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Cap
1	6K7	0V.	0V.	230V.DC	86V.DC	0V.	91V.DC	6.7VAC	0V.	7V.DC
2	6K7	0V.	0V.	230V.DC	90V.DC	0V.	93V.DC	6.7VAC	0V.	8V.DC
3	6L7	0V.	0V.	226V.DC	96V.DC	-4.95V.DC	0V.	6.7VAC	0V.	11V.DC
4	6J7	0V.	0V.	122V.DC	122V.DC	122V.DC	0V.	6.7VAC	0V.	3V.DC
5	6K7	0V.	0V.	215V.DC	106V.DC	0V.	0V.	6.7VAC	0V.	7V.DC
6	6SK7	0V.	0V.	0V.	77V.DC	0V.	106V.DC	6.7VAC	218V.DC	
7	6SK7	0V.	0V.	0V.	-3.3V.DC	0V.	108V.DC	6.7VAC	223V.DC	
8	6H6	0V.	0V.	-45V.DC	4V.DC	-45V.DC	0V.	6.7VAC	4V.DC	
9	6N7	0V.	0V.	4V.DC	-8V.DC	-8V.DC	4V.DC	6.7VAC	-8V.DC	
10	6SJ7	0V.	0V.	0V.	-1.35V.DC	0V.	52V.DC	6.7VAC	165V.DC	
11	6SK7	0V.	0V.	0V.	-3.3V.DC	0V.	102V.DC	6.7VAC	215V.DC	
12	6H6	0V.	0V.	-1.9V.DC	0V.	-1.9V.DC	0V.	6.7VAC	0V.	
13	6J5	0V.	0V.	100V.DC	0V.	-1V.DC	-3.4V.DC	6.7VAC	0V.	
14	6F6	0V.	0V.	218V.DC	218V.DC	-13V.DC	-19.8V.DC	6.7VAC	0V.	
15	6F6	0V.	0V.	395V.DC	395V.DC	0V.	405V.DC	6.7VAC	38.5V.DC	
16	6F6	0V.	0V.	395V.DC	395V.DC	0V.	0V.	6.7VAC	38.5V.DC	
17	544G	0V.	425V.DC	0V.	475AC	0V.	475AC	0V.	425DC	
18	5Y3GT	0V.	310VAC	0V.	-240V.DC	0V.	-240V.DC	0V.	310VAC	

### RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Cap
1	6K7	0 $\Omega$	0 $\Omega$	16.7K $\Omega$	11K $\Omega$	0 $\Omega$	9.1K $\Omega$	.2 $\Omega$	0 $\Omega$	1.1MEG.
2	6K7	0 $\Omega$	0 $\Omega$	16.7K $\Omega$	11K $\Omega$	0 $\Omega$	9.1K $\Omega$	.2 $\Omega$	0 $\Omega$	1.1MEG.
3	6L7	0 $\Omega$	0 $\Omega$	18.5K $\Omega$	38K $\Omega$	43K $\Omega$	INF.	.2 $\Omega$	0 $\Omega$	460K $\Omega$
4	6J7	0 $\Omega$	0 $\Omega$	28K $\Omega$	28K $\Omega$	28K $\Omega$	INF.	.2 $\Omega$	.8 $\Omega$	45K $\Omega$
5	6K7	0 $\Omega$	0 $\Omega$	18.5K $\Omega$	11K $\Omega$	0 $\Omega$	INF.	.2 $\Omega$	0 $\Omega$	650K $\Omega$
6	6SK7	0 $\Omega$	0 $\Omega$	0 $\Omega$	270K $\Omega$	0 $\Omega$	11K $\Omega$	.2 $\Omega$	18.5K $\Omega$	
7	6SK7	0 $\Omega$	0 $\Omega$	0 $\Omega$	9K $\Omega$	0 $\Omega$	62K $\Omega$	.2 $\Omega$	18.5K $\Omega$	
8	6H6	0 $\Omega$	0 $\Omega$	195K $\Omega$	220K $\Omega$	195K $\Omega$	INF.	.2 $\Omega$	220K $\Omega$	
9	6N7	0 $\Omega$	0 $\Omega$	220K $\Omega$	1MEG.	1MEG.	220K $\Omega$	.2 $\Omega$	103K $\Omega$	
10	6SJ7	0 $\Omega$	0 $\Omega$	0 $\Omega$	50 $\Omega$	0 $\Omega$	44 $\Omega$	.2 $\Omega$	70K $\Omega$	
11	6SJ7	0 $\Omega$	0 $\Omega$	0 $\Omega$	9K $\Omega$	0 $\Omega$	62K $\Omega$	.2 $\Omega$	18.5K $\Omega$	
12	6H6	0 $\Omega$	0 $\Omega$	31K $\Omega$	0 $\Omega$	31K $\Omega$	INF.	.2 $\Omega$	0 $\Omega$	
13	6J5	0 $\Omega$	0 $\Omega$	63K $\Omega$	INF.	470K $\Omega$	278 $\Omega$	.2 $\Omega$	0 $\Omega$	
14	6F6	0 $\Omega$	0 $\Omega$	17K $\Omega$	17K $\Omega$	480K $\Omega$	1.6K $\Omega$	.2 $\Omega$	0 $\Omega$	
15	6F6	0 $\Omega$	0 $\Omega$	17.8K $\Omega$	17.8K $\Omega$	300 $\Omega$	17.6K $\Omega$	.2 $\Omega$	670 $\Omega$	
16	6F6	0 $\Omega$	0 $\Omega$	17.8K $\Omega$	17.8K $\Omega$	300 $\Omega$	INF.	.2 $\Omega$	670 $\Omega$	
17	5U4G	INF.	17.8K $\Omega$	INF.	51K $\Omega$	INF.	44K $\Omega$	INF.	17.8 $\Omega$	
18	5Y3GT	INF.	28 $\Omega$	INF.	20.7K $\Omega$	INF.	20.7K $\Omega$	INF.	28 $\Omega$	

### RESISTANCE READINGS IN THE B+ CIRCUITS MAY VARY WIDELY ACCORDING TO THE CONDITION OF THE FILTER CAPACITORS

- DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of  $\pm 10\%$  in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.

# PARTS LIST AND DESCRIPTIONS

## TUBES

ITEM No.	USE	REPLACEMENT DATA		RMA BASE TYPE	INSTALLATION NOTES
		HAMMARLUND PART No.	STANDARD REPLACEMENT		
1	1st RF Amp.	6K7	6K7	7R	
2	2nd RF Amp.	6K7	6K7	7R	
3	1st Det.	6L7	6L7	7T	
4	HF Oscillator	6J7	6J7	7R	
5	1st IF Amp.	6K7	6K7	7k	
6	2nd IF Amp.	6SK7	6SK7	8N	
7	3rd IF Amp.	6SK7	6SK7	8N	
8	2nd Det.	6H6	6H6	7Q	
9	Noise Limiter	6N7	6N7	8B	
10	BFO	6SJ7	6SJ7	8N	
11	AVC Amp.	6SK7	6SK7	8N	
12	AVC Rectifier	6H6	6H6	7Q	
13	1st AF Amp.	6J5	6J5	8Q	
14	AF Driver	6F6	6F6	7S	
15	AF Output	6F6	6F6	7S	
16	AF Output	6F6	6F6	7S	
17	Rectifier	5U4G	5U4G	5T	
18	Rectifier	5Y3GT	5Y3GT	5T	

## CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA					IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	HAMMARLUND PART No.	SOLAR PART No.	SPRAGUE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	
19	1	1000	23843-4	XCGX10-1	PC-11	1010-1000-1	TLA10010	Filter
20	16	500	23842-13	D-16-600	AP-16	GL600-16	KR616	"
21A	8	450	23842-28	D-3X8-450	PLS-888	GL450-8-8-8	KR5888A	Filter-Red, Neg.-Blk.
B	8	450						" -Blu., " -Yel.
C	8	450						" -Grn., " -Br.
22A	8	450	23842-28	D-3X8-450	PLS-888	GL450-8-8-8	KR5888A	Filter-Red, Neg.-Blk.
B	8	450						" -Blu., " -Yel.
C	8	450						" -Grn., " -Br.
23	40	150	6171	N-40-150	UT-401	PRS150-40	BR4015	Cath. Bypass
24	.25	500	23912-38	S-6-25	TC-2	684-.25	DT6P25	RF Bypass Pwr. Supp.
25	.25	500	23912-38	S-6-25	TC-2	684-.25	DT6P25	"
26	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	Audio Coupling
27	.02	600	23912-1	S-6-02	TC-12	684-02	DT6S2	"
28	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	AVC Filter
29	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	AVC Amp. Screen Bypass
30	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	BFO Plate Decoup.
31	.25	600	23912-38	S-6-25	TC-2	684-.25	DT6P25	AVC Filter CW Position
32	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	3rd IF Screen Bypass
33	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	3rd IF Grid Bypass
34	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	2nd IF Plate Decoup.
35	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	2nd IF Screen Bypass
36	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	2nd IF Grid Bypass
37	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	1st IF Plate Decoup.
38	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	1st IF Screen Bypass
39	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	1st Det. Plate Decoup.
40	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	HF Osc. Plate Bypass
41	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	1st Det. Screen Bypass
42	.02	600	23912-1	S-6-02	TC-12	684-02	DT6S2	Mixer AVC Filter
43	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	2nd RF Screen Bypass
44	.02	600	23912-1	S-6-02	TC-12	684-02	DT6S2	2nd RF AVC Filter
45	.05	600	23912-2	S-6-05	TC-15	684-05	DT6S5	1st RF Screen Bypass
46	.02	600	23912-1	S-6-02	TC-12	684-02	DT6S2	1st RF AVC Filter
47	.02	600	23912-1	S-6-02	TC-12	684-02	DT6S2	AVC Filter
48	51	500	23001-59	MOS.5-45	MS-45	1469-00005	5R5C5	Limiter Plate Bypass
49	51	500	23003-50	MOS.5-45	MS-45	1469-00005	5R5C5	Osc. Grid Capacitor
50	95	500	6195					" Coupling
51	620	500	23005-86					RF Coupling
52	620	500	23005-86					"
53	300	500	23003-105D	MOS.5-33	MS-33	1469-0003	5R5T3	"
54	300	500	23003-105D	MOS.5-33	MS-33	1469-0003	5R5T3	"
55	620	500	23005-86					"

# PARTS LIST AND DESCRIPTIONS (Continued)

## CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA					IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	HAMMARLUND PART No.	SOLAR PART No.	SPRAGUE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	
56	873	500						Fixed Padder
57	1500	500						"
58	3300	500						"
59	300	500						"
60	Fixed	Trimmer	Three Ceramic Capacitors in series. May not be used in all models.					

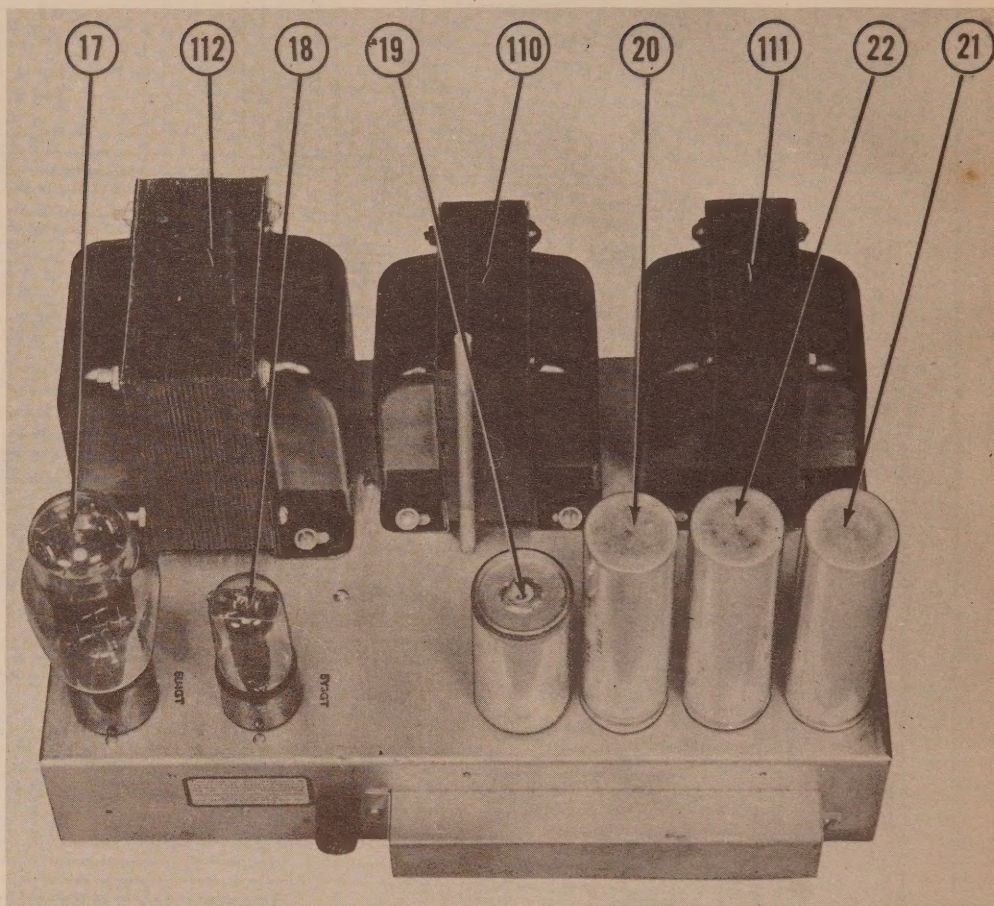
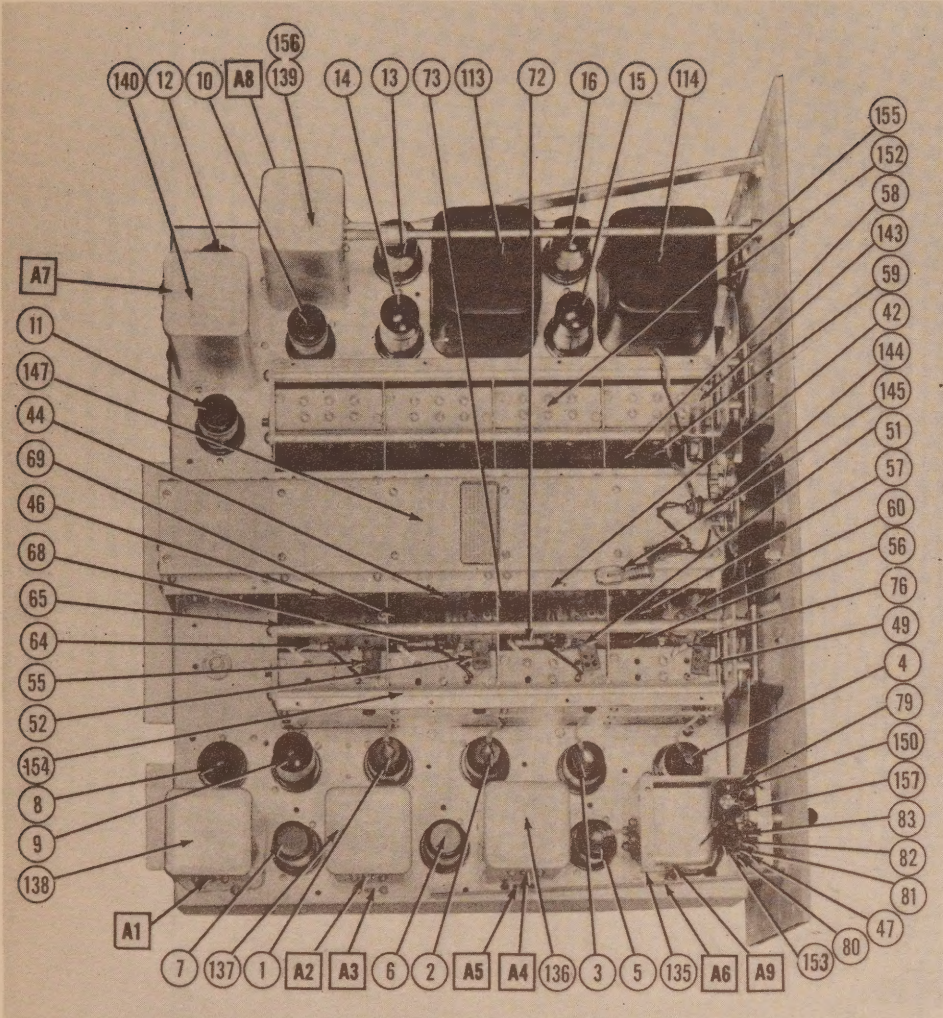
## CONTROLS

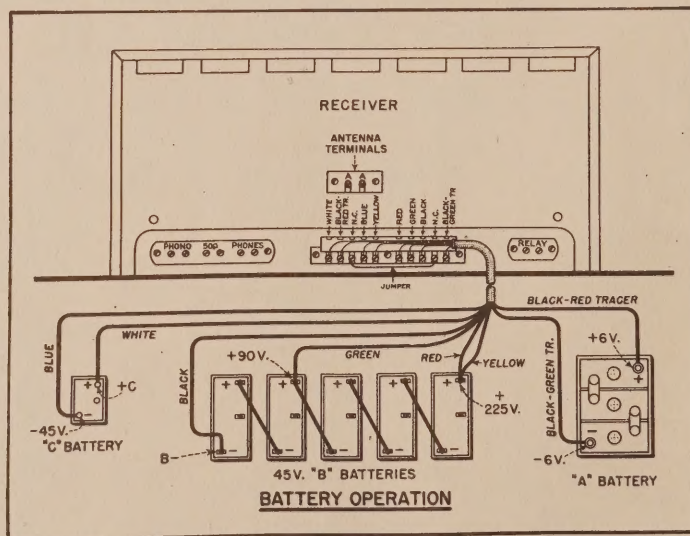
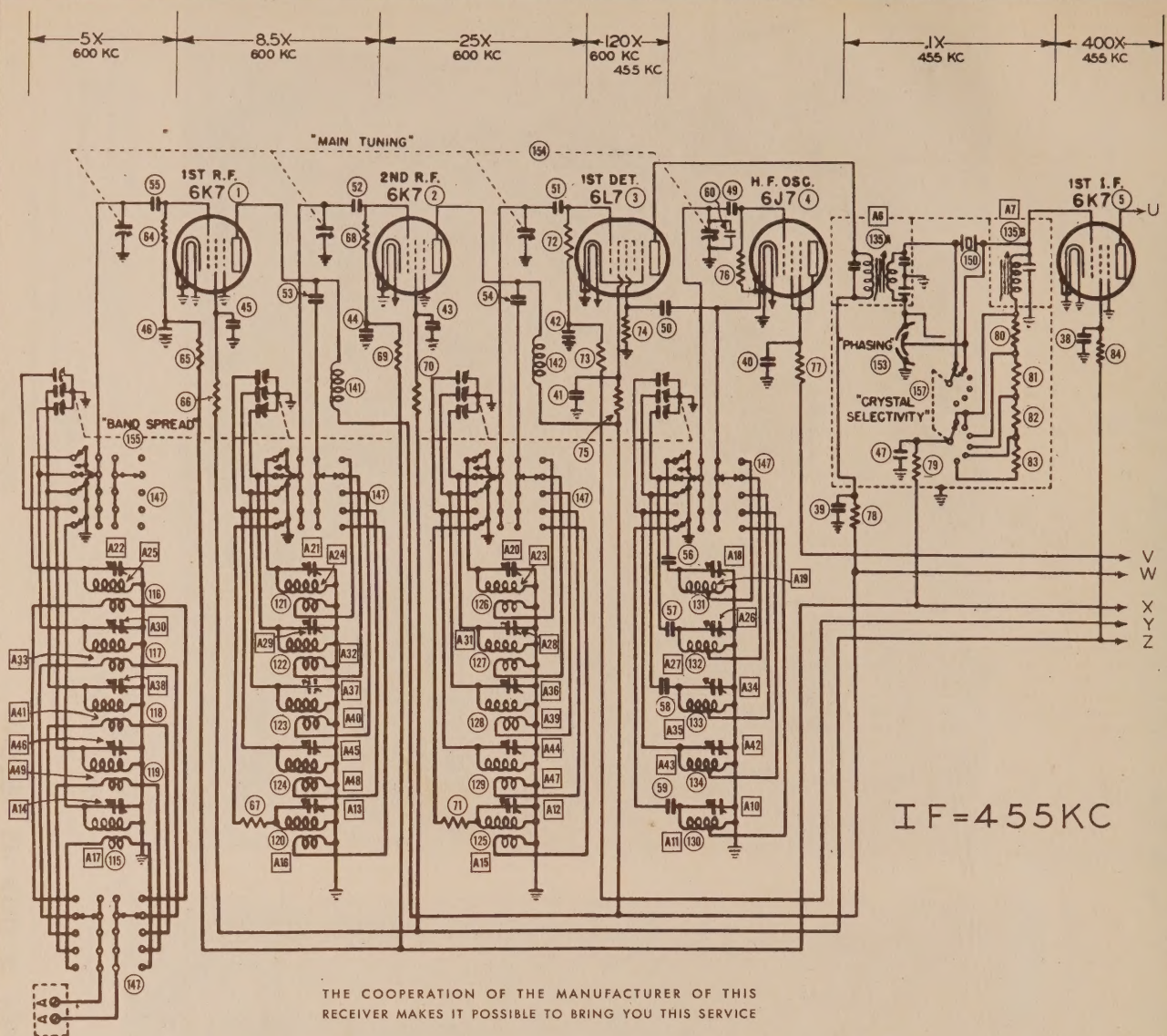
ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	HAMMARLUND PART No.	MALLORY PART No.	IRC PART No.	CLAROSTAT PART No.	
61A	250KΩ	1	4919	MR44	D13-130	M-64-Z	Audio Gain Control.
B	Shaft		Not Req.	Not Req.	A	Not Req.	Attach to 61A per instructions
62A	50KΩ	1	5023	MR35	D11-123	M-44-S	Sensitivity Control
B	Shaft		Not Req.	Not Req.	A	Not Req.	Attach to 62A per instructions
63	1000Ω	2	4932	CMF #	W-1000	43-1000	Meter Adj. Control.

# Mount with insulating washers Mallory # 203 & 212.

## RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	HAMMARLUND PART No.	IRC PART No.	
64	500KΩ	1/3	4959	BTS-470K	AVC Network
65	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network
66	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red 1st RF Screen Dropping
67	20Ω	1/2	19301-183	BW-2-22	Red-Blk.-Blk. Parasitic Suppressor
68	500KΩ	1/3	4959	BTS-500K	AVC Network
69	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network
70	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red 2nd RF Screen Dropping
71	20Ω	1/2	19301-183	BW-2-22	Red-Blk.-Blk. Parasitic Suppressor
72	500KΩ	1/2	4959	BTS-470K	AVC Network
73	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network
74	50KΩ	1/3	4960	BTS-47K	Injection Grid
75	25KΩ	2		BTS-2-27K	Red-Grn.-Or. Mixer Screen Dropping
76	50KΩ	1/3	4960	BTS-47K	Oscillator Grid
77	12KΩ	2	19304-44	BTS-2-12K	Br.-Red-Or. Oscillator Plate Decoupling
78	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red Mixer
79	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network See Note 1
80	24Ω	1/2	19301-178	BTS-22K	Red-Yl.-Blk. Selectivity Network See Note 1
81	51Ω	1/2	19301-167	BTS-47K	Grn.-Br.-Blk. " " " " "
82	300Ω	1/2	19301-196	BW-2-270	Or.-Blk.-Br. " " " " "
83	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red " " " " "
84	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red 1st IF Screen Decoupling
85	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red " " Plate
86	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network
87	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red 2nd IF Screen Decoupling
88	2KΩ	1/2	19301-206	BTS-2200	Red-Blk.-Red " " Plate
89	10KΩ	1/2	19309-73	BTS-10K	Br.-Blk.-Or. AVC Network
90	51KΩ	1	19303-182	BTA-47K	Grn.-Br.-Or. 3rd IF Screen Dropping
91	75KΩ	1/2	19301-215	BTS-68K	V1.-Grn.-Or. Diode Load
92	47KΩ	1/2		BTS-47K	Y1.-V1.-Or. " " " " "
93	240KΩ	1/2	19301-155	BTS-220K	Red-Yl.-Yl. Detector Cathode
94	4Ω	5	19431-1	AB-3	Series Limiter Filament
95	510KΩ	1/2	19309-159	BTS-470K	Grn.-Br.-Yl. BFO Screen Dropping
96	5KΩ	1/2		BTS-4700	Grn.-Blk.-Red " Plate
97	47KΩ	1/2		BTS-47K	Y1.-V1.-Or. " " Load
98	51KΩ	1	19303-182	BTA-47K	Grn.-Br.-Or. AVC Amp. Screen Dropping
99	2 Meg.	1/2	19301-169	BTS-2.2 Meg.	Red-Blk.-Grn. " Network
100	4Ω	5	19431-1	AB-3	Series Pilot Light
101	510KΩ	1/2	19309-159	BTS-470K	Grn.-Br.-Yl. 1st AF Grid
102	300Ω	1/2	19301-196	BW-2-270	Or.-Blk.-Br. Bias Network

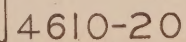
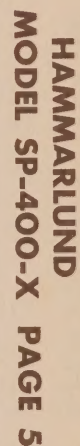




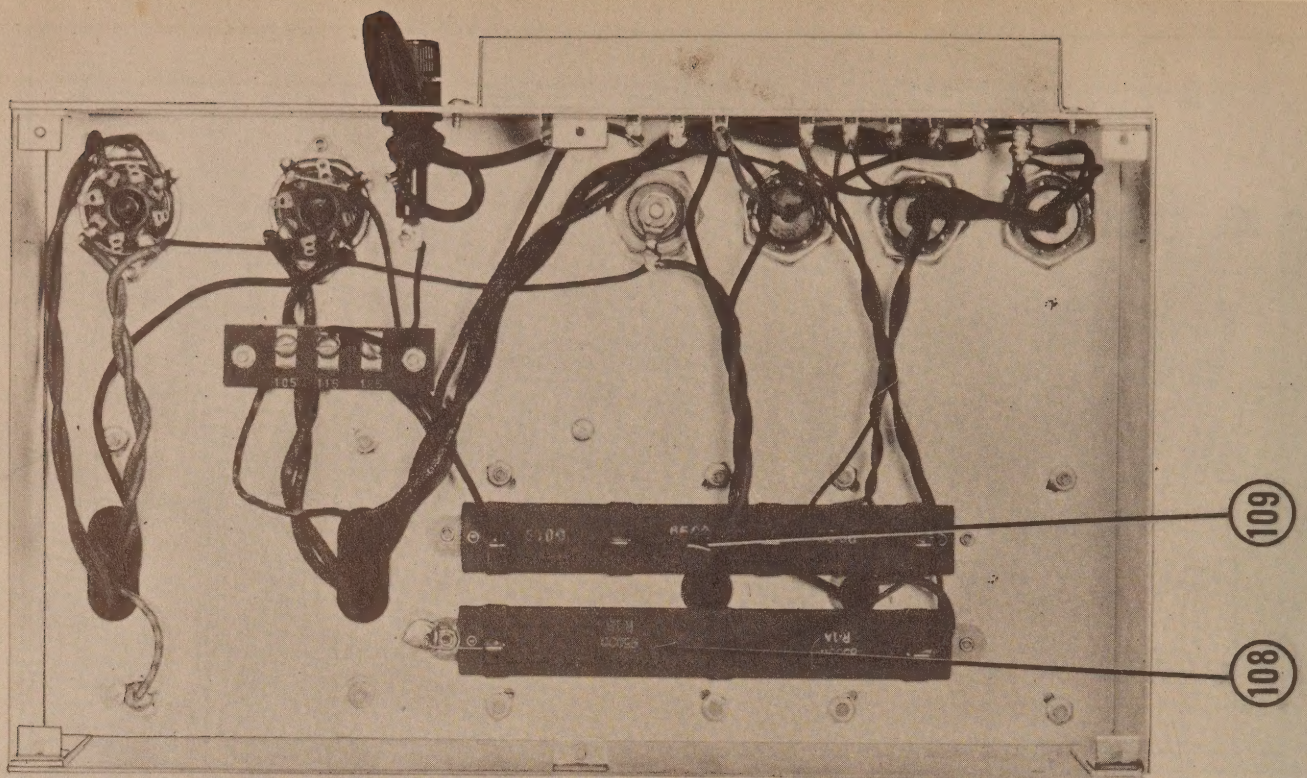
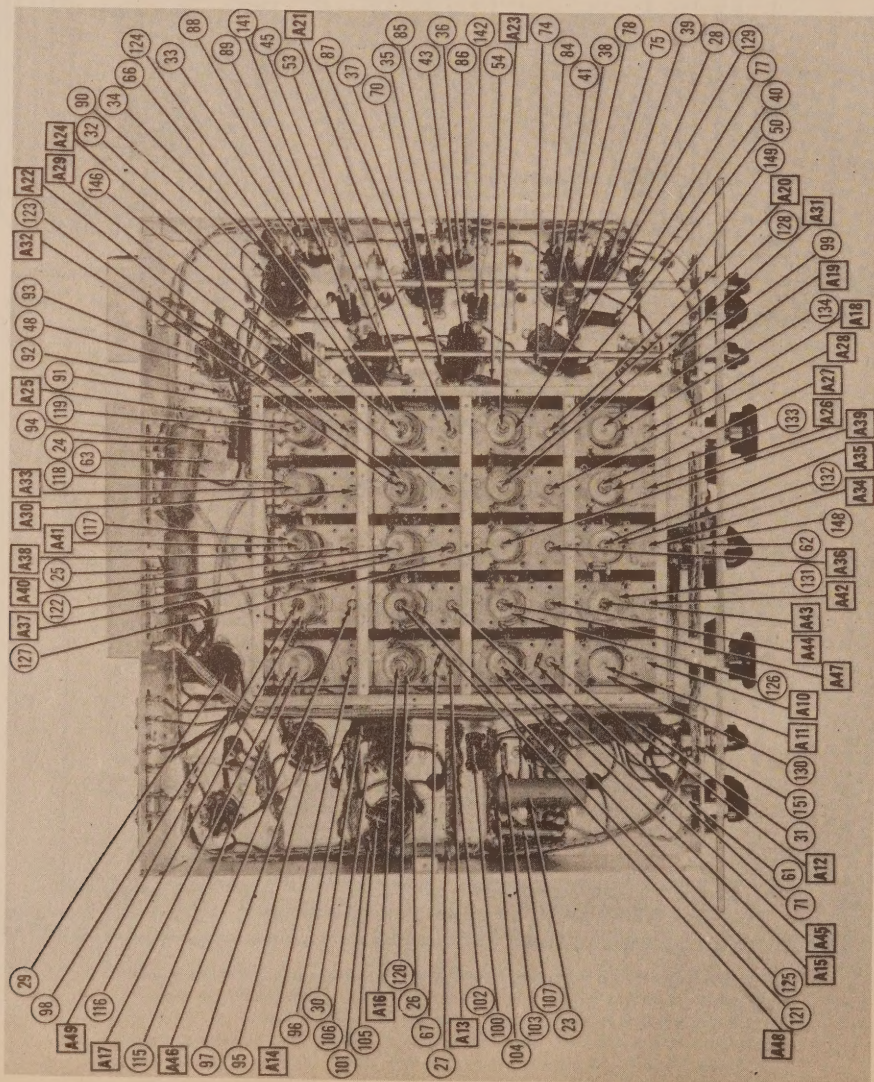
Connections for power cable—battery operation.

4610-20

The stage gain measured values listed above are approximate values for an average operative stage, rather than an absolute value. It should be borne in mind that it is possible to introduce so many variables into the measurement operation, such as, type of equipment used for measuring, handling and placement of probes, the accuracy of alignment, etc., that an absolute reading is impractical. AVC is made inoperative and 3-volt battery bias substituted for measurement.



# CHASSIS—BOTTOM VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	HAMMARLUND PART No.	IRC PART No.	
103	1700Ω	1/2		BTS-1800	Br.-V1.-Red " "
104	3000Ω	1	19303-169	BTA-3300	Or.-Blk.-Red Bias Network
105	47KΩ	1		BTA-47K	Yl.-V1.-Or. 1st AF Plate Load
106	510KΩ	1/2	19309-159	BTS-470K	Grn.-Br.-Yl. AF Driver Grid
107	750	10	19430-30	AB-750	Output Cathode
108	18K	10	4946	ABA-20,000	Bleeder See Note 2
109	18K	10	3997	AB-5000 & DHA-12,000	Filter See Note 3

Note 1: In IF selectivity transformer can.

Note 2: On IRC replacement set slider at 18000Ω from one end.

Note 3: " " " DHA 12,000, set slider at center. Add Ab-5000 in series.

### FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA		INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000~)	HAMMARLUND PART No.	
110	.150A	150Ω	12 Henries	2981	
111	.107A	1140Ω	78 Henries	4819	

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA		
	PRI.	SEC. 1	SEC. 2	SEC. 4	HAMMARLUND PART No.	STANCOR PART No.	THORDARSON PART No.
112	117V AC @1.46A Tapped @105V 115V & 125V	950V CT @.150A @310V AC @.010A	5.2V AC @3.0A SEC. 3 5.2V AC @1.8A	6.7V AC @6.35A	4801		

### TRANSFORMER (DRIVER)

ITEM No.	RATING			REPLACEMENT DATA			INSTALLATION NOTES
	DC RES.	URNS	RATIO	HAMMARLUND PART No.	STANCOR PART No.	THORDARSON PART No.	
113	630Ω	690Ω CT	1.35 to 1	4887	A-4405*	T20D77*	*Drill new mounting holes.

### TRANSFORMER (OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA			INSTALLATION NOTES
	IMPEDANCE	DC RES.	PRI.	SEC. 1	HAMMARLUND PART No.	STANCOR PART No.	THORDARSON PART No.	
114	10,000Ω CT	500Ω	620Ω CT.	55Ω	4888	A-3304*	T22S76*	* Drill new mounting holes.

### R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA		INSTALLATION NOTES
		PRI.	SEC.	HAMMARLUND PART No.	MEISSNER PART No.	
115	B1 Ant.Coil	1	6Ω	29520-G1		
116	B2 " "	.5Ω	0Ω	29529-G1		
117	B3 " "	.3Ω	0Ω	29532-G1		
118	B4 " "	.1Ω	0Ω	29535-G1		
119	B5 " "	0Ω	0Ω	29538-G1		
120	B1 RF Coil	.3Ω	5.5Ω	29521-G1		
121	B2 " "	.2Ω	.1Ω	29530-G1		
122	B3 " "	.1Ω	0Ω	29533-G1		
123	B4 " "	.1Ω	0Ω	29536-G1		
124	B5 " "	.1Ω	0Ω	29539-G1		

## PARTS LIST AND DESCRIPTIONS (Continued)

### R F COILS

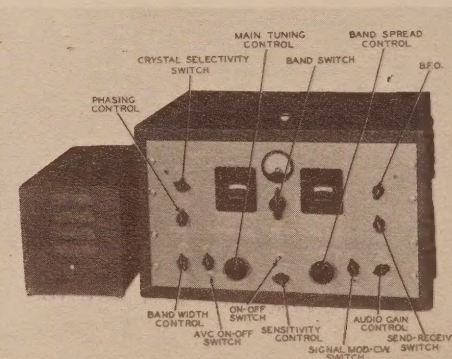
ITEM No.	USE	DC RES.		REPLACEMENT DATA		INSTALLATION NOTES
		PRI.	SEC.	HAMMARLUND PART No.	MEISSNER PART No.	
125	B1 Det.Coil	.3Ω	5.5Ω	29521-G1		
126	B2 " "	.2Ω	.1Ω	29530-G1		
127	B3 " "	.1Ω	0Ω	29533-G1		
128	B4 " "	.1Ω	0Ω	29536-G1		
129	B5 " "	.1Ω	0Ω	29539-G1		
130	B1 Osc.Coil		4Ω	29528-G1		
131	B2 " "		1Ω	29531-G1		
132	B3 " "		.4Ω	29534-G1		
133	B4 " "		0Ω	29537-G1		
134	B5 " "		0Ω	29540-G1		
135A	1st IF	7.5Ω	1.5Ω	29555-G1		
135B	2nd IF		1Ω	29555-G1		
136	3rd IF	12Ω	1.5Ω	SA168A		
137	4th IF	12Ω	1.5Ω	SA168A		
138	5th IF			SA167A		
139	BFO			SA169A		
140	AVC IF			SA168A		
141	RF Choke	39Ω		609-1		
142	RF Choke	39Ω		609-1		

### DIAL LIGHT

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA		INSTALLATION NOTES
					HAMMARLUND PART No.		
143	Screw	6-8	0.15	brown			Type 40
144	Screw	6-8	0.15	brown			Type 40
145	Screw	6-8	0.15	Brown			Type 40

### MISCELLANEOUS

ITEM No.	PART NAME	HAMMARLUND PART No.	NOTES
146	Limiter Switch	4916	SPST Rotary Snap
147	Band Switch		10 Pole - 5 Position - 5 Sect.
148	On-Off Switch	2983-1	DPST - Toggle
149	Band Width Cont.		
150	Crystal	6338	Resonator Type (455KC)
151	Mod.-CW Sw.	5733	DPST Rotary Snap
152	Send-Rec. Sw.	5729	SPST " "
153	Phasing Cap.	SA-179	2-6 MMF (Each Sect.)
154	Main Tuning Cap.		4 Gang
155	Bandspread Cap.		4 Gang
156	BFO Var. Cap.	SA-170	9 MMF
157	Crystal Switch	4911	Wafer Type - 6 Position



# ALIGNMENT INSTRUCTIONS

To set signal generator to the exact freq. of crystal, proceed as follows: Turn Band Switch to 2.85-6.3MC, main tuning dial near 2.85 making sure not to tune in a powerful local signal. Set the Crystal Selectivity switch to 3, phasing control at arrow, the AVC-MANUAL switch to AVC and advance SENSITIVITY to 10. Connect high side of signal generator to grid cap of the 6L7. Low side to chassis. Set signal generator at 455KC with modulation off. Adjust signal generator freq. slightly to produce maximum deflection of the "S" meter. Reduce sensitivity to "0" and turn modulation on. Do not change freq. of signal generator throughout IF alignment.

Before starting alignment set controls as follows: Set SENSITIVITY control to give half scale reading on output meter, AVC-MANUAL switch to MANUAL, SIGNAL-MOD-CW to MOD., SEND-REC. to REC., Band Switch to 2.85-6.3 MC, AUDIO GAIN to 10, CRYSTAL SELECTIVITY to OFF position, PHASING on arrow, LIMITER off, Band width to 3 and Band Spread Dial to 100. Keep input from signal generator at approx. 100 microvolts for all adjustments. Keep sensitivity control no higher than is necessary to obtain output reading. Have speaker connected throughout the alignment to monitor the signal. Connect one ant. terminal to chassis. Use insulated alignment screwdriver for adjusting.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
200 MMF.	High side to grid cap of 6L7. Low side to chassis.	Crystal freq. (see pre-alignment instructions)	2.85-6.3MC	2.85MC	500Ω terminals at the rear of chassis.	A1,A2, A3,A4, A5,A6.	Adjust for maximum output. Reduce sensitivity control to give half scale deflection of output meter, if necessary.
200 MMF.	"	Crystal Frequency	"	"	"	A7	Set audio gain to give half scale deflection, sensitivity to 10, AVC-Manual to AVC. Adjust A8 for minimum output. "S" meter should peak at same time output meter dips.
200 MMF.	"	"	"	"	"	A8	Turn Signal - Mod-CW switch to CW, AVC-Manual to manual. Set beat oscillator to 0. Adjust A9 to give zero beat. Then turn BFO off.
Do not attempt the following step unless a frequency-modulated signal generator and oscilloscope are available.							
200 MMF.	High side to grid cap of 6L7. Low side to chassis.	Freq. modulated at crystal freq.	2.85-6.3MC	2.85MC	Connect vert. amp. of scope to phono input terminals.	A9	Note pattern, then turn crystal selectivity switch to position 1. Pattern will narrow but should remain symmetrical. If it does not remain symmetrical, adjust A7 for symmetry while rocking phasing control. Turn crystal off after adjusting A9.
100 ohms	High side to ant. terminal. Low side to chassis.	1200KC (Mod. off)	540-1240KC	1200KC	500Ω terminals at the rear of chassis.	A10	Set band width at 13. Turn BFO on. Adjust for zero beat.
100 ohms	"	590KC (Mod. off)	"	590KC	"	A11	Adjust for zero beat. Repeat last two steps until no further improvement can be made.
100 ohms	"	1200KC (Amplitude Mod. on)	"	1200KC	"	A12,A13, A14.	Adjust for maximum output with BFO "off".
100 ohms	"	590KC (Mod. on)	"	590KC	"	A15,A16, A17.	Adjust for maximum output. Repeat last two steps until no further increase can be obtained.
100 ohms	"	2.85MC (Mod. off)	1.24-2.86MC	2.85MC	"	A18	Adjust for zero beat with BFO on.
100 ohms	"	1.3MC (Mod. off)	"	1.3MC	"	A19	Adjust for zero beat. Repeat last two steps until no further improvement can be made.
100 ohms	"	2.85MC (Mod. on)	"	2.85MC	"	A20,A21, A22.	Adjust for maximum output with BFO off.
100 ohms	"	1.3MC (Mod. on)	"	1.3MC	"	A23,A24, A25.	Adjust for maximum output. Repeat last two steps until no further increase can be obtained.
100 ohms	"	6.2MC (Mod. off)	2.85-6.3MC	6.2MC	"	A26	Adjust for zero beat with BFO "on".
100 ohms	"	2.85MC (Mod. off)	"	2.85MC	"	A27	Adjust for zero beat. Repeat last two steps until no further improvement can be made.
100 ohms	"	6.2MC (Mod. on)	"	6.2MC	"	A28,A29, A30.	Adjust for maximum output with BFO off.
100 ohms	"	2.85MC (Mod. on)	"	2.85MC	"	A31,A32, A33.	Adjust for maximum output. Repeat last two steps until no further increase can be obtained.
100 ohms	"	14.0MC (Mod. off)	6.3 - 14.0MC	14.0MC	"	A34	Adjust for zero beat with BFO on.
100 ohms	"	6.3MC (Mod. off)	"	6.3MC	"	A35	Adjust for zero beat. Repeat last two steps until no further improvement can be made.
100 ohms	"	14.0MC (Mod. on)	"	14.0MC	"	A36,A37, A38.	Adjust for maximum output with BFO off.
100 ohms	"	6.3MC (Mod. off)	"	6.3MC	"	A39,A40, A41.	Adjust for maximum output. Repeat last two steps until no further increase can be obtained. Check calibration. If off, repeat last four steps.
100 ohms	"	30.0MC (Mod. off)	13.4-30.0MC	30.0MC	"	A42	Adjust for zero beat with BFO on.
100 ohms	"	14.0MC (Mod. off)	"	14.0MC	"	A43	Adjust for zero beat. Repeat last two steps until no further improvement can be made.
100 ohms	"	30.0MC (Mod. on)	"	30.0MC	"	A44,A45, A46.	Adjust for maximum output with BFO off.
100 ohms	"	14.0MC (Mod. on)	"	14.0MC	"	A47,A48, A49.	Adjust for maximum output. Repeat last two steps until no further increase can be obtained. Check calibration. If off, repeat last four steps.

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